

WHAT IS CLAIMED IS:

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1. A thin film magnetic head comprising:
an insulating gap layer provided between cores
made of a magnetic material; and
a coil for inducing a recording magnetic field
in the cores,
wherein the gap layer comprises a SiON film.

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10 2. A thin film magnetic head according to Claim 1,
wherein the Young's modulus E of the gap layer is $E > 123.2$ (GPa).

3. A thin film magnetic head according to Claim 2,
wherein the atomic ratio of N of the SiON film is $0 \text{ (at\%)} < N \text{ atomic \%} \leq 6 \text{ (at\%)}.$

15 4. A thin film magnetic head according to Claim 2,
wherein the Young's modulus E of the gap layer is $E \geq 127.4$ (GPa).

5. A thin film magnetic head according to Claim 4,
wherein the atomic ratio of N of the SiON film is $1 \text{ (at\%)} \leq N \text{ atomic \%} \leq 6 \text{ (at\%)}.$

20 6. A thin film magnetic head comprising:
an insulating gap layer between cores made of a
magnetic material; and
a coil for inducing a recording magnetic field
in the cores,
25 wherein the gap layer comprises a SiO₂ film,
and
wherein the Young's modulus E of the gap layer
is $E > 123.2$ (GPa).

7. A thin film magnetic head according to Claim 6, wherein the Young's modulus E of the gap layer is $E \geq 127.4$ (GPa).

5 8. A thin film magnetic head comprising:
a magnetoresistive element capable of detecting a recording signal due to a change in electric resistance with an external magnetic field; and

10 shield layers formed above and below the magnetoresistive element with gap layers provided therebetween,

wherein at least one of the gap layers comprises a SiON film.

9. A thin film magnetic head according to Claim 8, wherein the Young's modulus E of at least one of the gap layers is $E > 123.2$ (GPa).

10. A thin film magnetic head according to Claim 9, wherein the atomic ratio of N of the SiON film is $0 \text{ (at\%)} < N \text{ atomic \%} \leq 6 \text{ (at\%)}$.

20 11. A thin film magnetic head according to Claim 9, wherein the Young's modulus E of the gap layers is $E \geq 127.4$ (GPa).

25 12. A thin film magnetic head according to Claim 11, wherein the atomic ratio of N of the SiON film is $1 \text{ (at\%)} \leq N \text{ atomic \%} \leq 6 \text{ (at\%)}$.

13. A thin film magnetic head comprising:

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a magnetoresistive element capable of detecting a recording signal due to a change in electric resistance with an external magnetic field and

shield layers formed above and below the magnetoresistive element with gap layers provided therebetween,

wherein at least one of the gap layers comprises a SiO_2 film, and

wherein the Young's modulus E of at least one of the gap layers is $E > 123.2$ (GPa).

14. A thin film magnetic head according to Claim 13, wherein the Young's modulus E of at least one of the gap layers is $E \geq 127.4$ (GPa).

15. A method of manufacturing a thin film magnetic head comprising:

arranging a target and a substrate opposite to the target in a deposition apparatus; and

forming a gap layer of the thin film magnetic head,

wherein in forming the gap layer, a target composed of SiO_2 is prepared, and then sputtered with N_2 gas used as a sputtering gas flowing into the apparatus to form the gap layer comprising a SiON film.

16. A method of manufacturing a thin film magnetic head according to Claim 15, wherein the flow rate ratio of the N_2 gas in the sputtering gas is $0\% < \text{flow rate ratio of } \text{N}_2 \text{ gas} \leq 30\%$.

17. A method of manufacturing a thin film magnetic head according to Claim 16, wherein the flow rate ratio

of the N₂ gas is preferably in the range of $5\% \leq$ flow rate ratio of N₂ gas $\leq 30\%$.

18. A method of manufacturing a thin film magnetic head according to Claim 15, wherein forming the gap layer, comprises supplying a bias electric power to the substrate side.

19. A method of manufacturing a thin film magnetic head comprising:

arranging a target and a substrate opposite to the target in a deposition apparatus; and

forming a gap layer of the thin film magnetic head,

wherein in forming the gap layer, the target composed of SiO₂ is prepared and then sputtered with the bias electric power supplied to the substrate to form the gap layer comprising a SiO₂ film having a Young's modulus E of $E > 123.2$ (GPa).

20. A method of manufacturing a thin film magnetic head according to Claim 19, wherein the bias electric power is equal to or greater than 10 W.

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